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| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.           | CONFIRMATION NO. |
|--|-------------|----------------------|-------------------------------|------------------|
| 10/798,383   | 03/12/2004  | Hiroaki Nakai        | 250290US2RD                   | 5652             |
| 22850 7590 04/20/2007<br>OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.<br>1940 DUKE STREET<br>ALEXANDRIA, VA 22314 |             |                      | EXAMINER<br>ALLISON, ANDRAE S |                  |
|  |             |                      | ART UNIT                      | PAPER NUMBER     |
|  |             |                      | 2624                          |                  |

| SHORTENED STATUTORY PERIOD OF RESPONSE | NOTIFICATION DATE | DELIVERY MODE |
|--|-------------------|---------------|
| 3 MONTHS                               | 04/20/2007        | ELECTRONIC    |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 04/20/2007.

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|                              |                               |                              |  |
|------------------------------|-------------------------------|------------------------------|--|
| <b>Office Action Summary</b> | Application No.<br>10/798,383 | Applicant(s)<br>NAKAI ET AL. |  |
|                              | Examiner<br>Andrae S. Allison | Art Unit<br>2624             |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 12 March 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 June 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>March 12, 2004</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 101*

1. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The USPTO "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility" (Official Gazette notice of 22 November 2005), Annex IV, reads as follows:

Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." In this context, "functional descriptive material" consists of data structures and computer programs which impart functionality when employed as a computer component. (The definition of "data structure" is "a physical or logical relationship among data elements, designed to support specific data manipulation functions." The New IEEE Standard Dictionary of Electrical and Electronics Terms 308 (5th ed. 1993).) "Nonfunctional descriptive material" includes but is not limited to music, literary works and a compilation or mere arrangement of data.

When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. Compare *In re Lowry*, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) (claim to data structure stored on a computer readable medium that increases computer efficiency held statutory) and *Warmerdam*, 33 F.3d at 1360-61, 31 USPQ2d at 1759 (claim to computer having a specific data structure stored in memory held statutory product-by-process claim) with *Warmerdam*, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure per se held nonstatutory).

In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory. See *Lowry*, 32 F.3d at 1583-84, 32 USPQ2d at 1035.

Claims 6,9,14 and 17 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter as follows. Claims 6,9,14 and 17 define software embodying functional descriptive material. However, the claims does not define a computer-readable medium or memory and is thus non-statutory for that reason (i.e., "When functional descriptive material is recorded on some computer-

readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized" – Guidelines Annex IV). That is, the scope of the presently claimed software can range from paper on which the program is written, to a program simply contemplated and memorized by a person. The examiner suggests amending the claims to embody the program on "computer-readable storage medium" or equivalent in order to make the claim statutory. Any amendment to the claim should be commensurate with its corresponding disclosure.

The examiner suggest that applicant amends the beginning of the preamble of claims 6,9,14 and 17 to read as follows: "A computer program product tangibly embodying a program of instructions stored on a computer-readable storage medium which is executed by a computer to perform a process for ..."

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-2, and 4-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arai (US Patent No.: 6,813,370) in view of Lee et al (US Patent No.: 7,113,632).

As to independent claim 8, Arai discloses a stereo image monitoring method for monitoring a common area (method for recognizing lane markers; column 1, lines 7-10),

Art Unit: 2624

which photographed by a pair of image pickup devices (see column 2, lines 55-67), the method comprising: inputting a pair of images (reference and comparison image data, see column 3, lines 11-16) from the image pickup devices (see column 3, lines 1-5); detecting at least four straight lines (see Fig 4) from each of input images (note that the ); detecting at least four sets of corresponding lines between the images using an image feature in neighboring areas of the straight lines (see column 3, lines 18-40, where stereo matching is done using the reference and comparison images); calculating a transformation matrix between the image pickup devices by using the sets of corresponding lines (see column 12, lines 23-67) and transforming one of the pair of images by using the transformation matrix to detect an object in the common area (see column 3, lines 5-8, where geometrical transformation of the images is performed). However, Arai does not expressly calculating a transformation matrix. Lee discloses a rectification method (see column 1, lines 6-8) that includes calculating a transformation matrix (see column 17, lines 1-25). At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have combined the teaching of Arai and Lee for the rectification of a stereoscopic image pair intended for display on a stereoscopic image display by rectifying the two captured images making up the image pair so as to substantially eliminate vertical disparity from the rectified image pair (column 2, lines 11-16).

As to independent claim 7, this claim differs from claim 8 only in that claim 7 is apparatus whereas, claim 8 is method and the limitations an image input device, a

straight-line detector, a straight-line correspondence detector, a transformation matrix calculator and a monitor transforming one of the pair of images by using the transformation matrix to detect an object in the common area are additively recited. Arai discloses a stereoscopic type vehicle surroundings monitoring apparatus (see Fig 1) that comprises: an image input device (1, see Fig 1), a straight-line detector (10, see Fig 1), a straight-line correspondence detector (6, see Fig 1), a transformation matrix calculator (5, see Fig 1). However, Arai does not expressly disclose a monitor transforming one of the pair of images by using the transformation matrix to detect an object in the common area. Lee discloses a rectification apparatus (see Fig 1) that includes a monitor (17, see Fig 3a) transforming one of the pair of images by using the transformation matrix to detect an object in the common area. Thus combining Arai with Lee would meet the claim limitation for the same reasons as discussed with respect to claim 8 above.

As to independent claim 9, this claim differs from claim 8 only in that claim 9 is program whereas, claim 8 is method and the limitations a program which is executed by a computer to perform a process for obtaining a transformation matrix are additively recited in the preamble. Arai clearly teaches a program (see Fig 2) which is executed by a computer (9, see Fig 1) to perform a process for obtaining a transformation matrix.

As to independent claim 5, all the limitations are discussed above except: a stereo calibration method for obtaining a transformation matrix, which is an image

transformation parameter between a pair of image pickup devices for photographing a preset common area. Lee discloses a stereo calibration method (method for rectifying a stereoscopic image pair, see column 1, lines 7-8) for obtaining a transformation matrix (rectification transformation; see column 1, line 9), which is an image transformation parameter between a pair of image pickup devices for photographing a preset common area. Thus combining Arai with Lee would meet the claim limitation for the same reasons as discussed with respect to claim 8 above.

As to independent claim 1, all the limitations are discussed above except a calibration apparatus. Lee clearly teaches a calibration apparatus (see Fig 3a). Thus combining Arai with Lee would meet the claim limitation for the same reasons as discussed with respect to claim 8 above.

As to independent claim 6, this claim differs from claim 5 only in that claim 6 is program whereas, claim 5 is method and the limitations a program which is executed by a computer to perform a process for obtaining a transformation matrix are additively recited in the preamble. Arai clearly teaches a program (see Fig 2) which is executed by a computer (9, see Fig 1) to perform a process for obtaining a transformation matrix.

As to independent claim 10, note the discussion of claim 1 above.

As to independent claim 13, note the discussion of claim 5 above.

As to independent claim 14, note the discussion of claim 6 above.

As to independent claim 15, note the discussion of claim 7 above.

As to independent claim 16, note the discussion of claim 8 above.

As to independent claim 17, note the discussion of claim 9 above.

As to claim 2, Arai teaches the stereo calibration apparatus, wherein the straight-line correspondence detector performs area matching by using the image feature in the neighboring areas of the straight lines to detect the sets of corresponding lines (see column 3, lines 18-40, where stereo matching is done using the reference and comparison images)

As to claim 4, note the discussion above, Lee teaches the stereo calibration apparatus, wherein the transformation matrix calculator calculates the transformation matrix in accordance with a linear expression by using the sets of corresponding lines and a projective transformation expression regarding the straight lines (column 9, lines 53-65).

As to claim 11, Arai teaches the stereo calibration apparatus, wherein the



straight-line correspondence detector obtains the geometrical relation among the straight lines by using an intersection between one of the straight lines in each image and the others of the straight lines in each image (column 7, line 39-55).

As to claim 12, note the discussion of claim 2 above.

4. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arai (US Patent No.: 6,813,370) in view of Lee et al (US Patent No.: 7,113,632) further in view of Gracias et al (NPL Document titled: Robust Estimation of the Fundamental Matrix and Stereo Correspondences).

As to claim 3, Neither Arai or Lee disclose the stereo calibration apparatus, wherein: the straight-line correspondence detector obtains data series regarding the image feature from the neighboring area of each straight line, obtains a normalized distance between the data series for each straight line detected from one of the images and the data series for each straight line detected from the other of the images, and obtains the sets of corresponding straight lines sets in such a manner that one straight line in the other of the images, which has the minimum normalized distance with respect to one straight line in the one of the images, is set as a corresponding line to the one straight line in the one of the images.

Gracias discloses a apparatus for estimating correspondences between stereo pairs including wherein: the straight-line correspondence detector obtains data series regarding the image feature from the neighboring area of each straight line, obtains a

Art Unit: 2624

normalized distance between the data series for each straight line detected from one of the images and the data series for each straight line detected from the other of the images, and obtains the sets of corresponding straight lines sets in such a manner that one straight line in the other of the images, which has the minimum normalized distance with respect to one straight line in the one of the images, is set as a corresponding line to the one straight line in the one of the images (see page 2, [p][002-004] and page 3, [p][001]). At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have combined the teaching of Arai as modified by Lee and Gracias for estimating the correspondence between stereo images (see abstract) by using the Random Sampling Consensus (RANSAC) to find a consensus group ([p][004], lines 1-4).

### ***Conclusion***

The prior art made part of the record and not relied upon is considered pertinent to applicant's disclosure.

Nakano et al (US Patent No.: 5,487,116) is cited to teach a vehicle recognition apparatus.

Iwai et al (US Patent No.: 7,023,473) is cited to teach a camera calibration device and method.

Nishigaki et al (US Patent No.: 6,963,657) is cited to teach an object recognition system.

Tsuji (US Patent No.: 6,868,168) is cited to teach a lane recognition system.

Nishigaki et al (US Patent No.: 6,731,777) is cited to teach an object recognition system.

Hayashi et al (US Patent No.: 6,526,157) is cited to teach a method for calculating a distance to a target point-using stereo.

Kang et al (NPL document titled: "Road lane segmentation using dynamic programming for active safety vehicles") is cited to teach a method to find the lane boundaries by combining a local line extraction method and dynamic programming.

Taylor et al (NPL document titled: "A Real-Time Approach to Stereopsis and Lane-Finding") is cited to teach a new real time stereo system for use in a highway navigation system.

Kweon et al (NPL document titled: "A Stereo Matching Algorithm Using Line Segment Features") is cited to teach a binocular-stereo matching algorithm.

### ***Inquires***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrae S. Allison whose telephone number is (571) 270-1052. The examiner can normally be reached on Monday-Friday, 8:00 am - 5:00 pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Mancuso can be reached on (571) 272-7695. The fax phone

Art Unit: 2624

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Andrae Allison

April 10, 2007

AA

JOSEPH MANCINI  
SUPERVISORY PATENT EXAMINER